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SOME MOLLUSKS FROM THE CONTINENTAL SLOPE OF NORTHEASTERN NORTH AMERICA[1]

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The continental slope area of northeastern North America has always been a relatively unknown and unexplored region. Only meager information has been on record in regard to the kind and abundance of its fauna. More knowledge is desirable, not only for academic interest, but also that proper evaluation may be made with the ultimate aim of supplementing man's ever-increasing need for additional sources of food.

With these objects in mind, in 1952 and 1953 the Woods Hole Oceanographic Institution began a survey of the bottom fauna existing on the continental slope area. An eighty-three foot trawler, the *Cap'n Bill II* was equipped for the task, and bottom trawlings were made along the slope from a point east of Cape Charles, Virginia, to a point southeast of Nova Scotia in various depths ranging approximately from 100 to 700 fathoms. Otter trawls were used carrying one and one-half inch mesh at the cod end, and measuring thirty-five feet, fifty feet, and sixty-five feet initially across the mouth. The work was under the direction of Mr. W. C. Schroeder of the Woods Hole Oceanographic Institution, to whom we are indebted for the fine array of mollusks collected.

Mollusks were not the primary concern of the survey, and the large size of the mesh prevented retention of the smaller specimens, though many of the larger species were obtained. These were submitted to Dr. W. J. Clench, Curator of Mollusks at the Museum of Comparative Zoology to be added to the research collection.

[1] Contribution No. 722 from the Woods Hole Oceanographic Institution.

After identification of the mollusks collected, a search of the literature was made so that the data gained from this survey could be compared with previous records. Two papers by A. E. Verrill (1884 and 1885) were found listing the bathymetric ranges of all of the then known western Atlantic species of marine mollusks found below 60 fathoms.

Verrill's records have apparently been generally overlooked by many of the more recent compilers of molluscan lists. His data, as obtained primarily from material gathered by the U.S. Fish Commission steamers *Fish Hawk* and *Albatross* from 1880 to 1884, indicate much more extensive bathymetric ranges for a great many species than have subsequently been given. W. H. Dall, in his "Preliminary Catalog . . ." (1889) omitted much of Verrill's data, and although Dall frankly stated that his catalog was incomplete, this oversight has been perpetuated by later writers. It is urged that future investigators refer to Verrill's most complete and excellent list as a supplement to modern lists.

In the following tabulation of species collected by the *Cap'n Bill II,* the minimum depth range indicated by the data is given. For instance, if a particular species was found at two stations where the depths of trawling ranged from 200 to 250 fathoms and from 300 to 350 fathoms respectively, the minimum range would be 250 to 300 fathoms. A distinction is also made between living and dead specimens, and bathymetric ranges are given for each, if not identical. For comparative purposes, the broadest bathymetric and geographic ranges indicated by the literature are also included, and information sources are cited. When geographic ranges are extended, these localities are defined in terms of miles from a position on land. When not extended, approximate location only is indicated.

By examination of the following list of 28 species, it will be seen that these new data have extended the previously recorded bathymetric ranges of seven species (marked *) and the geographic ranges of six species (marked †).

List of Mollusca Collected

Yoldia thraciaeformis (Storer)*†

One large dead specimen at station 72. *Bathymetric range*: 400 fms. dead (this survey); 29-182 fms. dead (Verrill 1884).

Geographic range: 240 mi. east of Sandy Hook, New Jersey (this survey); Gulf of St. Lawrence to Massachusetts (Johnson 1934); West Greenland (Thorson 1951).

Pecten vitreus (Gmelin)

Three living and two dead specimens at station 110. Three living specimens at station 208. *Bathymetric range*: 250-320 fms. (this survey); 50-800 fms. (Dall 1889). *Geographic range*: Arctic Ocean (Dall 1889); off Newfoundland and Nova Scotia (Johnson 1934); south of Nova Scotia (this survey); off Martha's Vineyard (Johnson 1934); east of Sandy Hook, New Jersey (this survey); west Florida [Gulf of Mexico] (Dall 1889); Europe; Mediterranean Sea; Africa (all Verrill 1884); west Greenland (Thorson 1951).

Anomia aculeata Müller

Living specimens attached to shells and rocks at stations 14, 19, 38, 53, 110, 131, 173, and 195. *Bathymetric range*: 145-320 fms. (this survey); 4-640 fms. (Verrill 1884); 0-80 fms. (Dall 1889). *Geographic range*: Arctic Ocean to Cape Hatteras, North Carolina (Dall 1889); south of Nova Scotia to east of Cape Henlopen, Delaware (this survey); Europe (Dall 1889).

A very variable species. The normal imbricated or scaly surface sculpture is entirely lacking in many individuals and in some entire large lots of specimens.

Arctica islandica (Linné)

Three single valves at station 1. *Bathymetric range*: 33 fms. dead (this survey); 6-90 fms. (Johnson 1934). *Geographic range*: east of Montauk Point, Long Island, New York (this survey); Arctic Ocean to Cape Hatteras, North Carolina (Dall 1889).

Astarte subaequilatera Sowerby

Three small living specimens at station 86. *Bathymetric range*: 230 fms. (this survey); 22-410 fms. (Johnson 1934). *Geographic range*: Labrador to Florida (Johnson 1934); south of Nova Scotia (this survey).

Panomya arctica (Lamarck)†

One very large, apparently freshly dead specimen at station 38. *Bathymetric range*: 190 fms. dead (this survey); 20-506 fms.

dead: 300 fms. alive (both, Verrill 1884). *Geographic range*: Arctic Ocean to Georges Bank; circumpolar (both, Johnson 1934); 170 mi. east of Barnegat Bay, New Jersey (this survey).

The specimen cited measures as follows: length 109 mm., height 74 mm., width (valves together) 48 mm. A similar specimen, alive and nearly as large, was taken nearby by the *Caryn* in 1949 (39°57′N., 70°38′W.), thereby confirming the fact that the species exists alive in this area.

Calliostoma bairdi Verrill and Smith

One dead specimen at station 83. One living specimen at station 146. *Bathymetric range*: 87 fms. dead; 65 fms. alive (both this survey); 56-640 fms. dead; 64-192 fms. alive (both, Verrill 1884). *Geographic range*: south southeast of Nantucket (270 mi. east of Barnegat Bay, New Jersey); east of Cape Henlopen, New Jersey (both, this survey); south of Martha's Vineyard to Florida Keys (Johnson 1934); Caribbean Sea (Verrill 1889).

The living specimen is very beautiful. Patches of lavender are seen through the thin iridescent periostracum which appears golden between the spiral rows of tubercules on the upper whorls and golden peach on the lower whorls. The inner nacre of the aperture shines with iridescent pink and green. The circular operculum is multispiral, typical of the family.

Solariella ottoi (Philippi)

One dead specimen at station 72. Three living specimens at station 211. *Bathymetric range*: 400 fms. dead; 600 fms. alive (both, this survey); 64-1555 fms. (Dall 1889). *Geographic range*: south of Martha's Vineyard and Georges Bank (Johnson 1934); east of Sandy Hook, New Jersey (this survey); New Jersey; Virginia (both, Dall 1889); Florida Keys; West Indies (both, Johnson 1934); St. Thomas, Virgin Islands (Dall 1889).

Natica clausa Broderip and Sowerby

One very large dead specimen (23 mm. long) at station 182. *Bathymetric range*: 280 fms. dead (this survey); 13-1255 fms. dead; 238-843 fms. alive (both, Verrill 1884); 16-1537 fms. (Johnson 1934). *Geographic range*: Arctic [Ocean] (Verrill 1884); Labrador to off North Carolina (Johnson 1934); south-

east of Cape Sable, Nova Scotia (this survey); Europe (Verrill 1884); Arctic and Bering seas to San Diego, California; Japan (both, La Rocque 1953).

Polinices heros (Say)

One dead specimen at station 144. *Bathymetric range*: 150 fms. dead (this survey); 0-238 fms. (Dall 1889). *Geographic range*: Gulf of St. Lawrence to North Carolina (Johnson 1934); east of Chincoteague Island, Virginia (this survey).

Polinices triseriata (Say)*

One very large, dead specimen (33 mm. long) at station 144. One dead specimen at station 200. *Bathymetric range*: 100-150 fms. dead (this survey); 0-63 fms. (Dall 1889). *Geographic range*: Labrador to Cape Hatteras (Dall 1889); south of Georges Bank to east of Chincoteague Island, Virginia (this survey).

Capulus ungaricus (Linné)

One small living specimen attached to *Pecten vitreus* at station 110. *Bathymetric range*: 320 fms. alive (this survey); 1-458 fms. (Johnson 1934). *Geographic range*: south southeast of Cape Sable, Nova Scotia (this survey); Greenland to Florida (Johnson 1934); Europe (La Rocque 1953).

Aporrhais occidentalis (Beck)*

Living specimens at stations 95 and 177. Dead specimens at stations 38, 83, 86, 95, 164, 176, 182, and 184. *Bathymetric range*: 340-360 fms. alive, 90-365 fms. dead (both, this survey); 115-349 fms. alive; 34½-1000 fms. dead (both, Verrill 1884). *Geographic range*: Gulf of St. Lawrence to off North Carolina (Johnson 1934); southeast of Nova Scotia to south of Nantucket (this survey); west Greenland (Thorson 1951).

Buccinum ciliatum Bruguière

One small living specimen at station 184 (southeast of Cape Sable, Nova Scotia). *Bathymetric range*: 265 fms. alive (this survey); 26-471 fms. (Johnson 1934). *Geographic range*: Arctic [Ocean] (Verrill 1884); Labrador to Cape Cod, Massachusetts (Johnson 1934); southeast of Cape Sable, Nova Scotia (this survey); Europe (Verrill 1884).

Neptunea decemcostata (Say)*†

Living specimens at stations 88, 95, 110, 165, 173, 182, and 184. Dead specimens at stations 38, 72, 86, 104, 164, 187, and 195. *Bathymetric range*: 270-360 fms. alive; 225-660 fms. dead (both this survey); 41-86 fms. alive; 6-322 fms. dead (both, Verrill 1884). *Geographic range*: Circumboreal (La Rocque 1953); Nova Scotia to Massachusetts Bay and Georges Bank (Johnson 1934); southeast of Nova Scotia to 240 mi. east of Barnegat Bay, New Jersey (south of Nantucket) (this survey).

Great variation of form exists in this species. Some specimens are attenuated to the extent that the length is 2½ times the greatest width. Other specimens show a length of only 1½ times the width. Variation is also seen in degree of sculpture, length of aperture in relation to overall length, etc. The possibility of the existence of one or more clines will be investigated.

Neptunea despecta tornata (Gould)*†

One small, dead specimen at station 159. *Bathymetric range*: 690 fms. dead (this survey); 10-471 fms. (Johnson 1934). *Geographic range*: Gulf of St. Lawrence to off Martha's Vineyard (Johnson 1934); 120 mi. east of Atlantic City, New Jersey (this survey).

Colus islandicus (Gmelin)

Dead specimens at stations 5, 22, 23, 29, 84, 144, 201, and 225. *Bathymetric range*: 85-415 fms. dead (this survey); 20-1650 fms. (Dall 1889). *Geographic range*: Labrador to Norway (Johnson 1934); Arctic Sea to South Carolina (Dall 1889), south of Georges Bank to east of Chincoteague Island, Virginia (this survey).

Colus stimpsoni stimpsoni (Mörch)

Two living specimens at station 152. One dead specimen at station 201. *Bathymetric range*: 330 fms. alive; 85-87 fms. dead (both, this survey); 1-471 fms. (Johnson 1934). *Geographic range*: Arctic Sea to [Cape] Hatteras, [North Carolina] (Dall 1889); south of Georges Bank to east of Cape Henlopen, New Jersey (this survey).

Colus pubescens (Verrill)*

Living specimens at stations 10, 13, 17, 53, 72, 139, 182, and

184. Dead specimens at stations 8, 10, 14, 17, 19, 35, 49, 83, 95, 104, 114, 131, 132, 139, 144, 164, 173, 184, and 225. *Bathymetric range*: 130-400 fms. alive; 90-415 fms. dead (both, this survey); 18-179 fms. dead; 192-640 fms. alive (both, Verrill 1884). *Geographic range*: Gulf of St. Lawrence to North Carolina (Johnson 1934); Nova Scotia to South Carolina (Dall 1889); southeast of Nova Scotia to east of Chincoteague Island, Virginia (this survey).

Pleurotomella agassizi Verrill and Smith†

One dead specimen at station 211. *Bathymetric range*: 600 fms. dead (this survey); 39-1309 fms. alive; 1608 fms. dead (both, Verrill 1884). *Geographic range*: 105 mi. southeast of Nantucket (this survey); south of Martha's Vineyard to the West Indies (Johnson 1934).

Scaphander punctostriatus (Mighels and Adams)

One living specimen at station 109 and one living specimen at station 189. *Bathymetric range*: 240-305 fms. alive (this survey); 46-1255 fms. alive; 1362-1467 fms. dead (both, Verrill 1884). *Geographic range*: Gulf of St. Lawrence to West Indies (Johnson 1934); southeast of Nova Scotia (this survey); Barbados; Norway (both, Dall 1889).

Rossia sublaevis Verrill

One living specimen at station 69. *Bathymetric range*: 490 fms. (this survey); 45-640 fms. (Johnson 1934). *Geographic range*: Newfoundland to 32°33′15″N. (Johnson 1934); south of Georges Bank (this survey).

Illex illecebrosa (Lesueur)

Two living specimens at station 68 and one living specimen at station 74. *Bathymetric range*: 450 fms. (this survey); 0-1022 fms.; beaks 1091-1917 fms. (both, Verrill 1884). *Geographic range*: south of Georges Bank (this survey); Greenland to Cape Hatteras (Johnson 1934).

Chiroteuthis lacertosa Verrill

One living specimen at each of the following stations: 68, 69, and 74. *Bathymetric range*: 490-500 fms. (this survey); 435-2369 fms. (Johnson 1934); arms, 2949 fms. (Verrill 1884).

Geographic range: south of Georges Bank (this survey); Nova Scotia to West Indies (Johnson 1934).

MASTIGOTEUTHIS AGASSIZII Verrill*

One living specimen at station 102. *Bathymetric range*: 600 fms. (this survey); 640-1050 fms. (Johnson 1934). *Geographic range*: Gulf of Maine to North Carolina (Johnson 1934); southeast of Nova Scotia (this survey).

ALLOPOSUS MOLLIS Verrill†

One living specimen at station 69 (south of Georges Bank) and one living specimen at station 90 (southeast of Nova Scotia). *Bathymetric range*: 330-490 fms. (this survey); 238-1346 fms.; fragment, 1735 fms. (both, Verrill 1884). *Geographic range*: 110 mi. southeast of Cape Sable, Nova Scotia; south of Georges Bank (both, this survey); Nantucket to Chesapeake Bay, eastern Atlantic (both, Johnson 1934).

BATHYPOLYPUS ARCTICUS (Prösch)

One living specimen at station 69 and one living specimen at station 72. *Bathymetric range*: 450-490 fms. (this survey); 28-843 fms. (Johnson 1934). *Geographic range*: south of Georges Bank (this survey); Bay of Fundy to 32°N. (Johnson 1934).

GRANELEDONE VERRUCOSA (Verrill)

One living specimen at station 69. *Bathymetric range*: 490 fms. (this survey); 466-1255 fms. (Johnson 1934). *Geographic range*: south of Georges Bank (this survey); Nova Scotia to Delaware Bay (Johnson 1934).

Location and Depth of Stations Cited

Station Number	North Latitude	West Longitude	Depth in Fathoms
1	40°50′	71°09′	33
5	39°35′	71°57′	240-260
8	39°36′	71°52′	405-410
10	39°46′	71°35′	395-405
13	39°55′	71°27′	180-190
14	39°56′	71°26′	150
17	39°55′	71°17′	290-330
19	39°57′	71°13′	175-180
22	39°53′	70°53′	300-330

23	39°52′	70°51′	375-420
29	39°52′	70°43′	415-440
35	40°02′	70°24′	105-110
38	40°04′	70°12′	190-225
49	39°57′	69°37′	415-560
53	39°55′	69°26′	165-180
68	40°08′	68°19′	400-510
69	40°10′	68°16′	490
72	40°12′	68°08′	400-450
74	40°17′	67°53′	450-500
83	39°59′	69°32′	87-90
84	39°59′	69°35′	82-85
86	42°23′	64°58′	230-245
88	42°46′	63°22′	340-350
90	42°41′	63°33′	300-330
95	42°45′	63°47′	330-340
102	42°35′	64°03′	560-600
104	42°40′	64°08′	350-380
109	42°20′	65°03′	305-320
110	42°17′	65°06′	320-360
114	40°46′	66°40′	290-300
131	38°13′	73°40′	145-160
132	38°08′	73°45′	205-275
139	37°38′	74°14′	120-130
144	37°45′	74°09′	150
146	38°33′	73°18′	63-65
152	38°39′	73°05′	330-400
159	39°26′	72°10′	690-720
164	42°43′	63°50′	310-335
165	42°42′	63°47′	360-370
173	42°40′	64°10′	240-270
176	42°33′	64°17′	280-320
177	42°32′	64°19′	360-420
182	42°28′	64°31′	280-305
184	42°23′	64°52′	265-295
187	42°15′	64°58′	660-705
189	42°18′	65°05′	220-240
195	40°34′	67°02′	290-300
200	40°46′	66°48′	100-105
201	40°45′	66°51′	85-87
208	40°09′	68°24′	250-340
211	40°00′	68°49′	600-670
225	39°53′	70°40′	345-355

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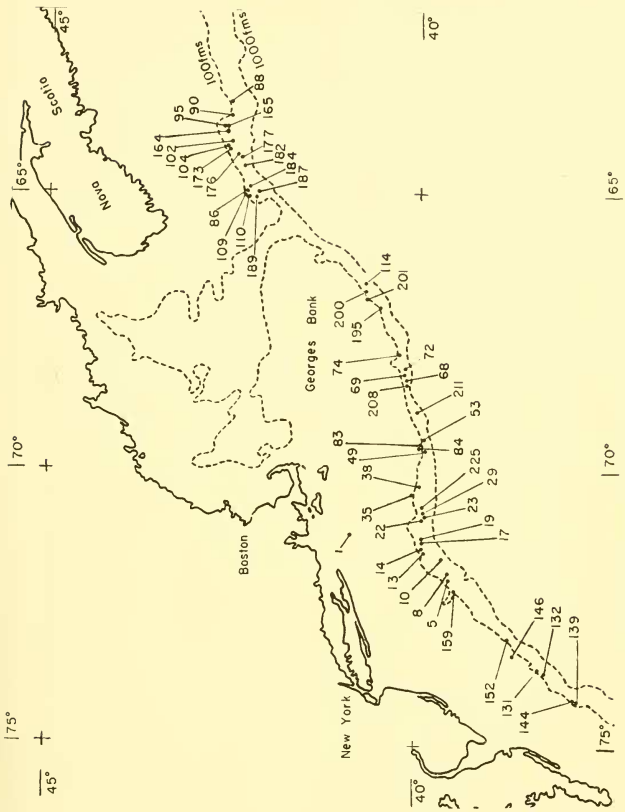

Map of continental slope area showing location of listed stations.